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# Investigation studies of vapor side corrosion in a multistage flash desalination pilot plant

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**ABSTRACT**

Vapor side corrosion (VSC) is one among different forms of corrosion encountered in multistage flash desalination (MSF). Vapor side corrosion is generally provoked and enhanced due to the presence of $CO_2$, $O_2$ and other non-condensable gases. Vapor side corrosion exhibits a major problem in both acid as well as additive dosed MSF plants. Although VSC has been reported by many workers in desalination field, only few studies were carried out in laboratory simulating real plant environment. The impact of vapor side environment on the corrosion rate of two commonly used materials of construction Cu-Ni 70/30 and Cu-Ni 90/10 was investigated at three levels of study through research program at an MSF actual plant, MSF pilot plant and in bench scale experimental up. This paper reports the studies carried out at an MSF pilot plant with capacity 20 $m^3$/d located at SWCC Al Jubail (SWDRI) by exposing Cu-Ni 70/30 and Cu-Ni 90/10 at four different top brine temperatures employed usually in MSF plants (90°C, 100°C,110°C and 119°C). The coupons exposed for 20 days in stage one, three and stage five in vertical and horizontal positions. Each stage has different temperature at brine and vapor sides. Experiments were carried out using actual chlorinated seawater from the Arabian Gulf. The results indicate that 70/30 Cu-Ni is more corrosion resistant than 90/10 Cu-Ni alloys. The corrosion rate for the coupons in horizontal position is higher than in vertical position tests. There is no clear effect of top brine temperature on the corrosion rate of copper nickel alloys. The corrosion rate at 90°C is higher than at 119°C which indicates that the air leakage is a strong factor and also the corrosion rate in stage three is more than in another stage in some tests. Different techniques employed in these studies include weight loss measurement, SEM and EDX.

*Keywords*: Multistage flash desalination; Non-condensable gases; Condenser tube vapor; Stage

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